INTRODUCTION

- Extraction defined as the treatment of the plant or animal tissues with solvent, whereby the medicinally active constituents or API are dissolved & most of the inert matter remain undissolved.

- GALEN a Greek pharmacist of Rome who described various methods of extracting the crude drugs for the first time & hence the branch dealing with the extraction of plant & animal drugs is known as Galenical pharmacy & the products as Galenicals.

CONT..

- Menstruum: solvent used for extraction.

- Marc: the insoluble material that remains extraction.

- Various process involved for extraction-
  - Infusion
  - Decoction
  - Maceration
  - Percolation
  - Continuous hot percolation or Soxhlet extraction or Soxhelation process.
  - Digestion

CONT…

- Following solvents are generally used for extraction
- ✓ Water & Alcohol

- ✓ **WATER:** it is used as a solvent for protein, colouring matter, gums, glycosides, sugars, alkaloidal salts, enzymes, many organic acids & most of the organic salts. Waxes, fats, fixed oils & most alkaloids are insoluble in water.
- ✓ **Disadvantages:** fermentation, decomposition of the preparation, chance to produce undesirable substances & interfere with clarity of the preparation.
- ✓ Use of preservatives.

CONT..

- Water causes hydrolysis of many substances.
- Larger amount of heat required compare with non-aqueous preparations.

- ✓ **ALCOHOL:** it is used as a solvent for alkaloids, alkaloidal salts, glycosides, volatile oils & resins. It also dissolves many forms of colouring matter, tannins, many organic acids & salts. Gums, albuminous matter, gums, waxes, fats, fixed oils & sugar those are not soluble in alcohol.
- ✓ **ADVANTAGES:** bacterial growth not occurs, if the solut.contains more than 20% alcohol, non-toxic, small amt.of heat is required.

EXTRACTION PROCESSES

INFUSION

- It consists of pouring water over the drugs and then allowing it to keep in contact with water for the stated period, usually 15 minutes, with occasional stirring and finally filtering off the liquid.

- The marc is not pressed.

- The boiling water is commonly used as a solvent, since it has a greater solvent action than cold water.

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01 INSERT SOFTBREW™ FILTER
02 ADD GROUND COFFEE
03 POUR IN HOT WATER
04 AFTER 4-8MINS YOUR COFFEE WILL BE READY
4-8 min

Cont…

- For the preparation of infusions the coffee pots or tea pots or special infusion pots are used.
- In that, firstly drug is placed in bottom of the pot.
- Then add hot water & stirred three or four times during the period of infusion.
- Infusion also prepared in muslin cloth. In that drug is placed in muslin cloth & enclose & then suspending it just below the level of the water in a beaker.
- For that process string is not required.

TWO TYPES OF INFUSION

- FRESH INFUSION

- CONCENTRATED INFUSION
- FRESH INFUSION

- Aqueous liquid used as a menstruum.
- It is prepared by…
- Coarse drug + Hot water then filtrate after some time.
- As per pharmacopoeia it is used within 12 Hrs after formulation.
- e.g. fresh infusion of Quassia.

CONT..

- CONCENTRATED INFUSION

- It is eight times stronger than fresh infusion.
- In that 20 to 25 % alcohol conc. used as a menstruum.
- It is prepared by double or triple maceration process.
- It can be stored for a longer time of period.
- e.g. Concentrated infusion of Quassia.

DECOCTION

- In this process, the drug is boiled with water for a stated period usually 10 minutes.
- After boiling, the liquid is strained and water is passed through the content of the strainer to make the required volume.
- This process is mainly used for vegetable drugs of hard and woody nature having thermostable water soluble constituents.

MACERATION

- In this process solid ingredients are placed in a stoppered container with the whole of the solvent and allowed to stand for a period of at least 3 days (3 - 7 days) with frequent agitation, until soluble matter is dissolved.

- The mixture is then strained (through sieves / nets), the marc pressed and the combined liquids clarified (cleaned by filtration).

CONT..

- **TYPES OF MACERATION :**
- Simple maceration: for organized and unorganized Crude drug

e.g. i) Tincture of Orange

ii) Tincture of Lemon

- Double maceration : Concentrated infusion of orange

- Triple maceration: The maceration process may be carried out with help of heat or stirring

CONT..

- **SIMPLE MACERATION**: for organized drugs e.g. roots, stems, leaves etc.
- ✓ Alcohol is used as a menstruum.
- ✓ In this process, the drug is placed with the menstruum in a closed vessel for seven days.
- ✓ At this period shaking is done occasionally.
- ✓ After seven days, the liquid is strained & marc is pressed.
- ✓ The expressed liquid is mixed with strained liquid.
- ✓ Then again filter for obtaining the clear liquid.
- ✓ The final volume is not adjusted.

CONT..

- **MODIFIED MACERATION or MACERATION WITH ADJUSTMENT :** for Unorganized drugs e.g. Gum, Resins, Gum-resins, Oleo gum-resins.

- ✓ In this process, the unorganized drug is placed with 4/5th volume of menstruum in a closed vessel for seven days.
- ✓ At this period shaking is done occasionally.
- ✓ After the stated period, the liquid is filtered & not necessary to press the marc.
- ✓ After that, the final volume is adjusted with the remaining quantity of 1/5th volume of menstruum through the filter.

CONT..

- **DOUBLE MACERATION PROCESS:** it is carried out in the same way as simple maceration process, but menstruum used in divided into two parts.
- In that process drug is macerated twice by using the menstruum which is divided into two parts in a such manner that the same volume is used for each maceration.
- The volume of menstruum required is calculated as follows

i. Volume of menstruum req. for first maceration

$$\frac{\text{Total Vol.of menstruum - Vol.to be retained by the drug}}{2} + \text{Vol.to be retained by the drug}$$

ii. Volume of menstruum req. for second maceration

Total vol.of menstrum – Vol. of menstruum used in first maceration

Cont..

- In that process the whole drug is macerated for 48 hrs with quty. of menstruum for first maceration.
- Strain the liquid & press the marc after 48 hrs.
- Then again macerated for 24 hrs with remaining quty. of menstruum for second maceration.
- Strain the liquid & press the marc after 24 hrs.
- Then mix the liquids obtained from the two maceration & allows it to stand for 14 days & then filter.
- e.g. Concentrated infusion of orange

  Concentrated compound infusion of chirata

CONT..

- **TRIPLE MACERATION PROCESS:** it is carried out in the same way as simple maceration process, but menstruum used in divided into three parts.
- In that process drug is macerated thrice by using the menstruum which is divided into three parts in a such manner that the same volume is used for each maceration.
- The volume of menstruum required is calculated as follows

i. Volume of menstruum req. for first maceration

$$\frac{\text{Total Vol.of menstruum - Vol.to be retained by the drug}}{3} + \text{Vol.to be retained by the drug}$$

ii. Volume of menstruum req. for 2nd & 3rd maceration

$$\frac{\text{Total vol.of menstrum – Vol. of menstruum used in first maceration}}{2}$$

CONT..

- In that the drug is macerated for one hour with a part of menstruum req. for first maceration & strained.
- Macerated again for one hour with a part of menstruum for second maceration & strained.
- Macerated again for one hour with a part of menstruum for third maceration & strained.
- After that, marc is pressed lightly.
- Then combine the liquids obtained from 2^{nd} & 3^{rd} maceration & evaporated it to a specified extent.
- Then, mix it with the liquid obtained from 1^{st} maceration & add alcohol 90% equal to $1/4^{th}$ of the volume of the finished product.
- Then adjust the volume with water.
- Allow this solution for 14 days & then filter.
- e.g. Concentrated infusion of Quassia, Liquid extract of senna

PERCOLATION PROCESS

- 3 types of percolation process used for the extraction of drugs are:

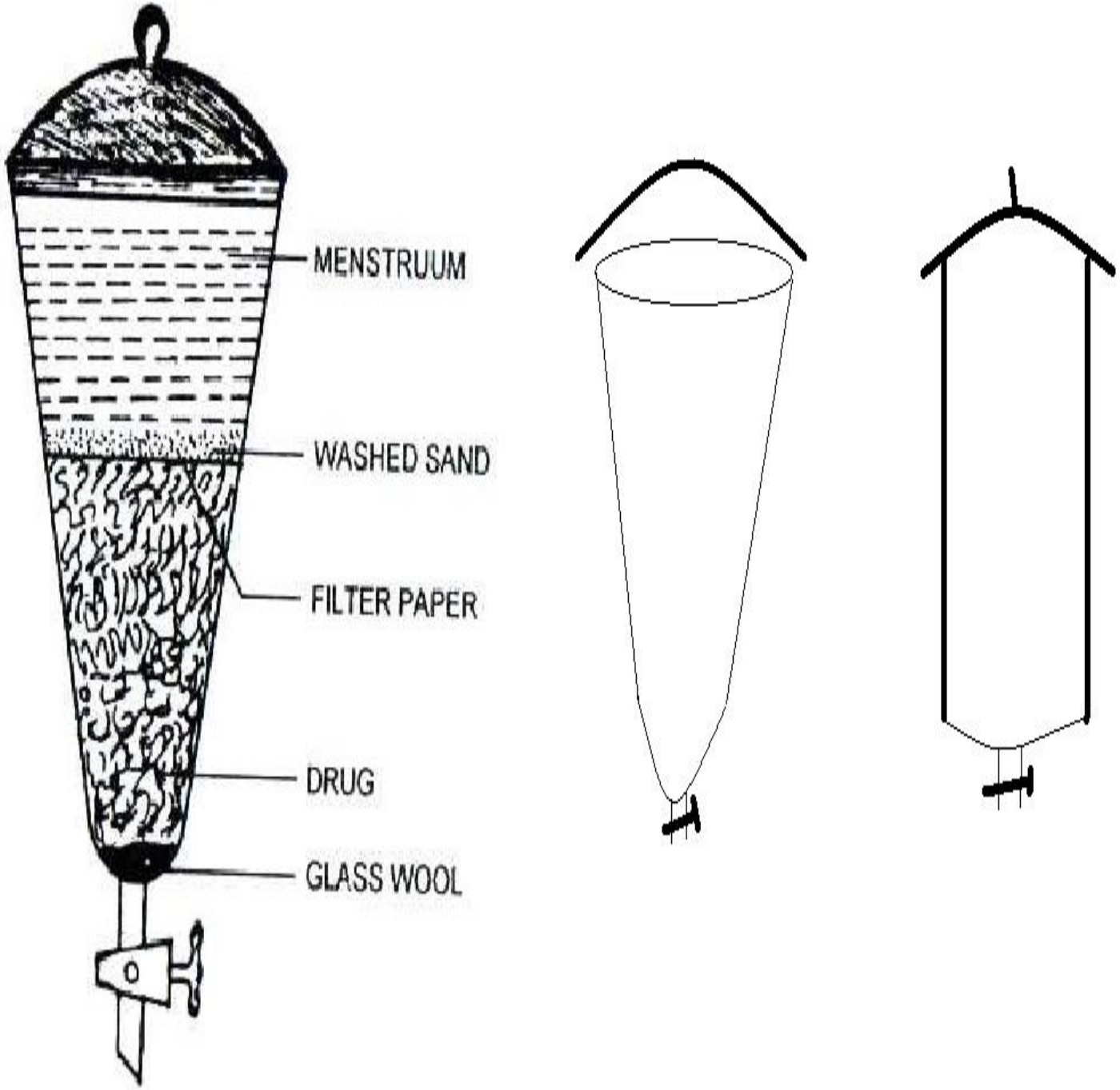
i. Simple percolation or percolation process for tinctures.

ii. Percolation process for concentrated preparations

a. Reverse percolation process

b. Modified percolation process

iii. Continuous hot percolation or soxhelation


MENSTRUUM
WASHED SAND
FILTER PAPER
DRUG
GLASS WOOL

SIMPLE PERCOLATION PROCESS

- In the percolator, arrange the powder on their size i.e coarse powder to fine powder.
- **Imbibition:** at that first stage, the drug firstly moisten or swelling of the tissues of the drug before packing it into the percolator.
- **Packing of the drug:** before packing the drug firstly pass through the sieves for prevention of lumps & masses.
- ✓ Then, glass wool moistened with the solvent is placed at the bottom of the percolator to prevent the blockage of the outlet trap.
- ✓ Then add the moisten drug into the percolator & pressed lightly after each addition & drug is packed upto 2/3rd or 3/4th of the percolator.

CONT..

- ✓ Then placed filter paper on the packed drug.
- ✓ Then placed washed sand on that for prevent disturbance of the top layers of the drug.
- ✓ Finally add the menstruum to saturate the material. When liquid starts coming out from the percolator ,outlet is closed.
- ✓ And again add menstruum in the percolator.
- ✓ Then allow it to macerate for 24 hrs. the percolator is closed to prevent evaporation of the solvent.

- **Maceration:** after 24 hrs maceration, open the outlet of the percolator & collect the percolate which measures about 3/4th of the volume required for the finish product.
- The rate of collection of percolate is generally 10-30 drops per minute.

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- After collecting the required quty. of percolator, the marc is taken out from the percolator & it is pressed to recover the solvent.
- Then adjust the final volume with menstruum.
- Then, liquid is filtered in order to free it from other material.
- e.g. Tincture of belladona, strong tincture of ginger.

PERCOLATION PROCESS FOR CONCENTRATED PREPARATIONS

- **RESERVE PERCOLATION PROCESS:**

- In this process, a part of the percolate, generally 3/4th the volume of the finished preparation, is reserved.

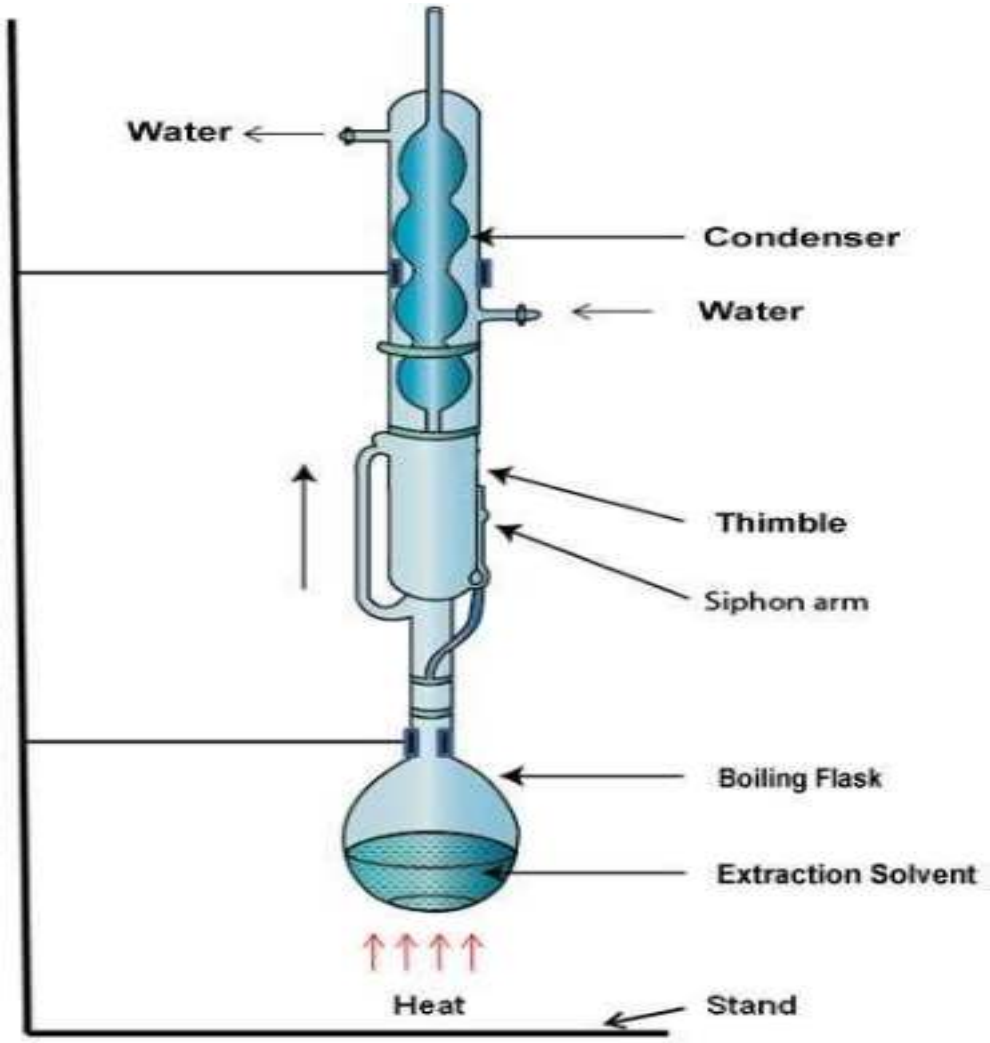
- Then the percolation process is continued till the drug is completely exhausted.

- Then the percolate is subjected evaporation or distillation to convert it into a soft extract.

- This soft extract is dissolved in the reserve portion of the percolate & then sufficient menstruum is added to produce the required volume.

CONTINUOUS HOT PERCOLATION OR SOXHELATION

- This process apply when, the drug are not freely soluble in the solvent.



CONT..

- The powdered plant material is packed in a thimble.
- The solvent is boiled in a flask. The evaporated solvent passes through the side tube of the extractor and condensed in the condenser, fitted at the top of the extractor.
- The condensed hot solvent runs into the thimble and soaks the material & extracts the constituents.
- When the chamber holding the thimble becomes full the solvent siphons down to the flask and the process is continuously repeated till extraction is complete

DIGESTION

- In digestion process, the drug is extracted by heating at a particular pressure.
- This will increase the penetration power of the menstruum, so that there is complete extraction of the drug.
- Percautions should be taken so that the increased temperature may not harm the active constituents of the drug.

CONT…

- The apparatus know as “Digestor” is used for extraction of the drug by this method.
- It is a vessel made up of metal. The whole of the drug along with the menstruum is placed in the body of the digestor.
- Place the cover over it and bolt it with the help of nuts.
- The drug is treated with menstruum for a definite period under specified conditions of temperature and pressure.

Factors affecting choice of extraction process

- **Character of drug**
- **Cost of drug:** costly drug extracted by percolator & cheap drug extracted by maceration process.
- **Stability of drug:** for thermolabile drugs avoid continous hot extraction process.
- **Solvent:** non-aq. Solvent used for extraction & water is used for maceration process.
- **Therapeutic value of drug:** when drug has considerable therapeutic value, the max .extraction is required, so percolation process is used.